WEST Search History

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DATE: Tuesday, March 09, 2004

Hide?	Set Name	Query	Hit Count
		DB=USPT; PLUR=YES; OP=ADJ	
☐	L16	4909962.pn.	1
☐	L15	L14 and ether and emulsion and dipropyleneglycol	4
☐	L14	4909962	74
☐	L13	L12 and ether and emulsion and dipropyleneglycol	4
☐	L12	5158710	56
☐	L11	L10 and dipropyleneglycol	1
☐	L10	L9 and ether	15
☐	L9	l8 and emulsion	22
☐	L8	(Re33210| 2073464| 2948686| 3254714| 3277013| 3382285| 3482632| 3500918| 3500919| 3504041| 3507798| 3625909| 3637022| 3673124| 3691072| 3697424| 3707506| 3741902| 3753904| 3764544| 3769209| 3872021| 4012329| 4022699| 4180472| 4414128| 4438009| 4540448| 4540505| 4561991| 4606840| 4704225| 4888119| 4909962| 4919839| 4931201| 4983224| 4990269| 5075026| 5076954| 5080822| 5080831| 5082584| 5108643| 5158710| 5171475)![pn]	46
☐	L7	L6 and emulsion	17
☐	L6	dpnp	50
☐	L5	dphp	9
☐	L4	L3 and (emulsion same azeotrop$)	22
☐	L3	L2 and emulsion	1931
☐	L2	($propyleneglycol with ether) or (propyl ether)	6290
☐	L1	6312996.pn.	1

END OF SEARCH HISTORY

L10: Entry 3 of 15 File: USPT Apr 28, 1992

DOCUMENT-IDENTIFIER: US 5108643 A
TITLE: Stable microemulsion cleaning composition

Brief Summary Text (1):
This invention relates to a stable microemulsion cleaning composition and to processes for manufacture and use thereof. More particularly, it relates to a stable aqueous microemulsion cleaning composition in concentrated or diluted form which, in the absence of any opacifying component, is clear, and which is especially effective to clean oily and greasy soils from substrates, such as bathroom fixtures and walls, leaving such surfaces clean and shiny without the need for extensive rinsing thereof. The described compositions comprise a synthetic organic detergent, an essentially water insoluble perfume (which may omit terpenes), water and a suitable co-surfactant, which co-surfactant, adjusts the interface conformation to reduce interfacial tension at interfaces between dispersed and continuous phases of the emulsion of the detergent, perfume and water, produces a stable, normally clear microemulsion, at room temperature. When the pH of the microemulsion is on the acid side, preferably in the range of 1 to 4, the invented compositions are useful for removing lime scale and soap scum from hard substrates.

Brief Summary Text (2):
Liquid detergent compositions, usually in solution or emulsion form, have been employed as all-purpose detergents and have been suggested for cleaning hard surfaces, such as painted woodwork, bathtubs, sinks, tile floors, tiled walls, linoleum, paneling and washable wallpaper. Many such preparations, such as those described in U.S. Pat. Nos. 2,560,839, 3,234,138, and 3,350,319, and British patent specification No. 1223739, include substantial proportions of inorganic phosphate builder salts, the presences of which can sometimes be found objectionable for environmental reasons and also because they necessitate thorough rinsing of the liquid detergent from the cleaned surface to avoid the presence of noticeable depositings of phosphate thereon. In U.S. Pat. Nos. 4,017,409 and 4,244,840 liquid detergents of reduced phosphate builder salt contents have been described but such may still require rinsing or can include enough phosphate to be environmentally objectionable. Some liquid detergents have been made which are phosphate-free, such as those described in U.S. Pat. No. 3,935,130, but these normally include higher percentages of synthetic organic detergent, which increased detergent content may be objectionable due to excessive foaming during use that can result from its presence. The previously described liquid detergent compositions are emulsions but are not disclosed to be microemulsions like those of the present invention.

Brief Summary Text (3):

Microemulsions have been disclosed in various patents and patent applications for liquid detergent compositions which may be useful as hard surface cleaners or all-purpose cleaners, and such compositions have sometimes included detergent, solvent, water and a co-surfactant. Among such disclosures are European patent specifications No's. 0137615, 0137616, and 0160762, and U.S. Pat. No. 4,561,991, all of which describe employing at least 5% by weight of the solvent in the compositions. The use of magnesium salts to improve grease removing performance of solvents in microemulsion liquid detergent compositions is mentioned in British patent specification No. 2144763. Other patents on liquid detergent cleaning compositions in microemulsion form are U.S. Pat. Nos. 3,723,330, 4,472,291, and 4,540,448. Additional formulas of liquid detergent compositions in emulsion form which include hydrocarbons, such as terpenes, are disclosed in British patent specifications 1603047 and 2033421, European specification No. 0080749; and U.S. Pat. Nos. 4,017,409, 4,414,128, and 4,540,505. However, the presence of builder salt in such compositions, especially in the presence of magnesium compounds, tends to destabilize the microemulsions and therefore such builders are considered to be undesirable.

Brief Summary Text (4):
Although the cited prior art relates to liquid all-purpose detergent compositions in emulsion form and although various components of the present compositions are mentioned in the art, it is considered that the art does not anticipate or make obvious subject matter disclosed and claimed herein. In accordance with the present invention a stable aqueous microemulsion cleaning composition, which may be in concentrated or dilute form, comprises anionic synthetic organic detergent and/or nonionic synthetic organic detergent, essentially water insoluble perfume, water and co-surfactant, which co-surfactant adjusts interfacial conformation to reduce interfacial tension at interfaces between dispersed and continuous phases of an emulsion of said detergent, perfume and water, and produces a stable concentrated microemulsion which, in the absence of opacifying component, is clear and stable at temperatures in the range of 5.degree. to 50.degree. C., and which is at a pH in the range of 1 to 11. Such concentrated microemulsion appears clear, in the absence of any opacifying agent in the composition, and is dilutable with water to at least five times its weight, to produce a diluted liquid detergent composition which is often also a stable aqueous microemulsion which, in the absence of opacifying agent, is also clear, and which is useful as an all-purpose cleaning composition. Both the concentrated and diluted compositions are effective for cleaning oily and greasy soils from substrates, and when the compositions are acidic they are also useful to remove lime scale and soap scum from hard surfaces, such as bathroom fixtures, floors and walls.

Brief Summary Text (8):
Preferred concentrations of the mentioned components of the concentrated microemulsion are 5 to 30% of synthetic organic detergent, 2 to 20% of perfume, 2 to 50% of co-surfactant and 50 to 85% of water. At such preferred concentrations, upon dilution of one part of concentrate with four parts of water the resulting microemulsion will be low in detergent and solvent contents, which may be desirable to avoid excessive foaming and to prevent destabilization of the emulsion due to too great a content of lipophilic phase therein after dissolving in the perfume or suitable hydrocarbon or other solvent of the oily or greasy soil to be removed from a substrate to be

cleaned. Because of the absence of builders when the cleaning composition consists of or consists essentially of the described components (with minor proportions of compatible adjuvants being permissible), a chalky appearance of the clean surface is avoided and rinsing may be obviated. Among the desirable adjuvants that may be present in the microemulsions are divalent or polyvalent metal salts, as sources of magnesium and aluminum, for example, which improve cleaning performances of the dilute compositions, and higher fatty acids and/or higher fatty acid soaps, which act as foam supressants. Of course, if it is considered aesthetically desirable for the normally clear microemulsions to be cloudy or pearlescent in appearance, an opacifying or pearlescing agent may be present and in some instances, when it is not considered disadvantageous to have to rinse the builder off the substrate, builder salts, such as polyphosphates, may be present in the microemulsions, but it should be stressed that normally builders will be absent from them.

Brief Summary Text (9):
Some preferred "dilute" microemulsion cleaning compositions of this invention are those which are of formulas such as are producible by mixing four parts by weight of water with one part by weight of the concentrated emulsion previously described. In such "dilute" compositions the preferred proportions of components will be 1 to 13% of anionic synthetic organic detergent and/or nonionic synthetic organic detergent, 0.4 to 10% of substantially water insoluble perfume, 0.4 to 10% of water miscible co-surfactant having either limited ability or substantially no ability to dissolve oily or greasy soil, and 83 to 97% of water. More preferred ranges of components in such dilute composition are 1 to 6%, 0.4 to 4%, 0.4 to 10% and 90 to 97%, respectively. When other dilutions are employed, from 1:1 to 1:19 of concentrated microemulsion : water, the percentages of such ranges and preferred ranges should be adjusted accordingly. In some instances dilutions to 1:99 are feasible and such diluted compositions may be used as is or may be further diluted in some applications, as when employed for hand dishwashing (with rinsing).

Brief Summary Text (16):
As employed herein and in appended claims the term "perfume" is used in its ordinary sense to refer to and include any essentially water insoluble fragrant substance or mixture of substances including natural (i.e., obtained by extraction of flowers, herbs, leaves, roots, barks, wood, blossoms or plants), artificial (i.e., a mixture of different natural oils or oil constituents) and synthetic (i.e., synthetically produced) odoriferous substances. Such materials are often accompanied by auxiliary materials, such as fixatives, extenders and stabilizers, and such are also included within the meaning of "perfume", as employed in this specification. Typically, perfumes are complex mixtures of a plurality of organic compounds such as odoriferous or fragrant essential oils, esters, ethers, aldehydes, alcohols, hydrocarbons, ketones, and lactones, but various other classes of materials may also be present, such as pyrrones, and pyrroles.

Brief Summary Text (17):
Among components of different types of perfumes that may be employed are the following: essential oils--pine, balsam, fir, citrus, evergreen, jasmine, lily, rose and ylang ylang; esters--phenoxyethyl isobutyrate, benzyl acetate, p-tertiary butyl cyclohexyl acetate, guaiacwood acetate, linalyl acetate, dimethylbenzyl carbinyl acetate, phenylethyl acetate, linalyl benzoate,

benzyl formate, ethylmethylphenyl glycidate, allylcyclohexane propionate, styrallyl propionate and benzyl salicylate; ethers--benzyl-ethyl ether; aldehydes--alkyl aldehydes of 8 to 18 carbon atoms, bourgeonal, citral, citronellal, citronellyl oxyacetaldehyde, cyclamen aldehyde, hydroxycitronellal and lilial; alcohols--anethol, citronellol, eugenol, geraniol, linalool, phenylethyl alcohol and terpineol; hydrocarbons--balsams and terpenes; ketones--ionones, alpha-isomethyl ionone, and methylcedryl ketone; lactones--gamma-alkyl lactone wherein the alkyl is of 8 to 14 carbon atoms; pyrrones--hydroxy-lower alkyl pyrrone wherein the alkyl is of 1 to 4 carbon atoms; and pyrroles--benzopyrrole.

Brief Summary Text (30):
Examples of satisfactory anionic sulfate detergents are the C.sub.8-18 alkyl sulfate salts and the C.sub.8-18 alkyl ether polyethenoxy sulfate salts having the formula R.sup.6 (OC.sub.2 H.sub.4).sub.n OSO.sub.3 M wherein R.sup.6 is alkyl of 8 or 9 to 18 carbon atoms, n is 1 to 22, preferably 1 to 5, and M is a solubilizing cation selected from the group consisting of sodium, potassium, ammonium, magnesium and mono-, di- and tri-ethanolammonium ions. The alkyl sulfates may be obtained by sulfating the alcohols obtained by reducing glycerides of coconut oil or tallow or mixtures thereof, and neutralizing the resultant organic sulfuric acid ester. The alkyl ether polyethenoxy sulfates may be made by sulfating the condensation product of ethylene oxide and C.sub.8-18 alkanol, and neutralizing the resultant product. The alkyl ether polyethenoxy sulfates differ from one another in the number of carbon atoms in the alcohols and in the number of moles of ethylene oxide reacted with one mole of such alcohol. Preferred alkyl sulfates and preferred alkyl ether polyethenoxy sulfates contain 10 to 16 carbon atoms in the alcohols and in the alkyl groups thereof, e.g., sodium lauryl sulfate, sodium myristyl (3 EtO) sulfate.

Brief Summary Text (31):
C.sub.8-18 Alkylphenyl ether polyethenoxy sulfates containing from 2 to 6 moles of ethylene oxide in the molecule also are suitable for use in the inventive microemulsion compositions. These detergents can be prepared by reacting an alkyl phenol with 2 to 6 moles of ethylene oxide and sulfating and neutralizing the resultant ethoxylated alkylphenol.

Brief Summary Text (42):
The co-surfactant component plays an essential role in the concentrated and diluted microemulsions of this invention. In the absence of the co-surfactant the water, detergent(s) and perfume (the only liponilic:material that is present) , when mixed in appropriate proportions, will form either a micellar solution, at lower concentrations, or a conventional oil-in-water emulsion. With the presence of the co-surfactant in such systems the interfacial tension or surface tension at the interfaces between the lipophile droplets and the continuous aqueous phase is greatly reduced, to a value close to 0 (10.sup.-3 dynes/cm.). This reduction of the interfacial tension results in spontaneous disintegration of the dispersed phase globules or droplets until they become so small that they cannot be perceived by the unaided human eye, and a clear microemulsion is formed, which appears to be transparent. In such microemulsion state thermodynamic factors come into balance, with varying degrees of stability being related to the total free energy of the microemulsion. Some of the thermodynamic factors involved in determining the total free energy of the system are (1) particle-particle potential; (2)

interfacial tension or free energy (stretching and bending); (3) droplet dispersion entropy; and (4) chemical potential changes upon formation of the microemulsion. A thermodynamically stable system is achieved when interfacial tension or free energy is minimized and when droplet dispersion entropy is maximized. Thus, it appears that the role of the co-surfactant in formation of a stable o/w microemulsion is to decrease interfacial tension and to modify the microemulsion structure and increase the number of possible configurations. Also, it seems likely that the co-surfactant helps to decrease rigidity of the dispersed phase with respect to the continuous phase and with respect to the oily and greasy soils to be removed from surfaces to be contacted by the microemulsions.

Brief Summary Text (43):
The co-surfactants that are useful in the present microemulsion compositions include: a water soluble lower alkanol of 2 to 6 carbon atoms (sometimes preferably 2 or 3 to 4 carbon atoms), a polypropylene glycol of 2 to 18 propoxy units, a monoalkyl ether of a lower glycol of the formula RO(X).sub.n H wherein R is C.sub.1-4 alkyl and X is CH.sub.2 CH.sub.2 O, CH(CH.sub.3) CH.sub.2 O or CH.sub.2 CH.sub.2 CH.sub.2 O, and n is from 1 to 4, a monoalkyl ester of the formula R.sup.1 O(X).sub.n H where R.sup.1 is C.sub.2-4 acyl and X and n are as immediately previously described, an aryl substituted lower alkanol of 1 to 4 carbon atoms, propylene carbonate, an aliphatic mono-, di-, or tri-carboxylic acid of 3 to 6 carbon atoms, a mono-, di- or tri-hydroxy substituted aliphatic mono-, di-, or tri-carboxylic acid of 3 to 6 carbon atoms, a higher alkyl ether poly-lower alkoxy carboxylic acid of the formula R.sup.2 O(X).sub.n YCOOH, wherein R.sup.2 is C.sub.9-15 alkyl, n is from 4 to 12, and Y is CH.sub.2, C(O)R.sup.3 or ##STR1## wherein R.sup.3 is a C.sub.1-3 alkylene, or a lower alkyl mono-, di-, or tri-ester of phosphoric acid, wherein the lower alkyl is of 1 to 4 carbon atoms, or any mixture thereof. Mixtures that may be used are mixtures of individual types of components and of different types.

Brief Summary Text (44):
Representative members of the mentioned polypropylene glycols include dipropylene glycol and polypropylene glycol having a molecular weight of 200 to 1,000, e.g., polypropylene glycol 400. Satisfactory glycol ethers and other glycol derivatives are ethylene glycol monobutyl ether (butyl cellosolve), diethylene glycol monobutyl ether (butyl carbitol), triethylene glycol monobutyl ether, tetraethylene glycol monobutyl ether, propylene glycol tertiary butyl ether, ethylene glycol monoacetate and dipropylene glycol propionate. Because they are capable of providing stable micro emulsions over a broad range of temperatures while avoiding any problems related to toxicity and/or environmental safety, two ethers based on dipropylene glycol are particularly preferred as co-surfactants. They are dipropylene glycol monobutyl ether and dipropylene glycol isobutyl ether, both of which are commercially available.

Brief Summary Text (46):
While all of the aforementioned glycol ether compounds and organic acids provide the described stability, the most preferred co-surfactant compounds of each type, on the basis of cost and cosmetic appearance (particularly odor), are diethylene glycol monobutyl ether, dipropylene glycol butyl and isobutyl ethers, and a mixture of adipic, glutaric and succinic acids. The ratio of acids in the foregoing acid mixture is not particularly critical and

can be modified (often to provide an acceptable or desirable odor). To maximize water solubility of the acid mixture, glutaric acid, the most water-soluble of these three saturated aliphatic dibasic acids, will be a significant component and may be present in major proportion. Generally, weight ratios of adipic acid: glutaric acid: succinic acid are 1-3:1-8:1-5, respectively, preferably 1-2:1-6:1-3, such as 1:1:1, 1:2:1, 2:2:1, 1:2:1.5, 1:2:2, 2:3:2, etc.

Brief Summary Text (49):
The pH's of the final microemulsions, concentrated or dilute, will be dependent in large part on the identity of the co-surfactant compound, with the choice of the co-surfactant also being affected by cost and cosmetic properties, often particularly odor or fragrance. For example, microemulsion compositions which are to have a pH in the range of 1 to 10 may employ either an alkanol, propylene glycol, or ethylene glycol or propylene glycol ether or ester, or an alkyl phosphate as the sole co-surfactant but such pH range may be reduced to 1 to 8.5 when polyvalent metal salt is present. The organic acid co-surfactant will be used as the sole co-surfactant when the product pH is to be below 3.2. The alkyl ether poly-lower alkoxy acids may be the sole surfactants when the product pH is to be below 5. Mixtures of acidic and other co-surfactants can be employed to make neutral and near neutral compositions of pH of 7.+-.1.5, preferably 7.+-.0.2. The ability to formulate neutral and acidic products without builders, which nevertheless have desirable grease removal capacities, is an important feature of the present invention because the prior art o/w microemulsion formulations of such properties usually were required to be highly alkaline, highly built, or both alkaline and built.

Brief Summary Text (54):
Such concentrated microemulsions, like other such emulsions previously mentioned, can be diluted by mixing with up to about 20 times or more, even sometimes to 100 times, but preferably about 3 or 4 to about 10 times their weight of water, e.g., 4 times, to form o/w microemulsions similar to the diluted microemulsion compositions described above. While the degree of dilution is suitably chosen to yield an o/w microemulsion composition after dilution, it should be recognized that during and at the ends of dilutions, especially when diluting from w/o concentrated emulsions, both microemulsion and non-microemulsion stages may be encountered.

Detailed Description Text (4):
This composition is made at room temperature (25.degree. C.) by dissolving the detergent and Epsom salts in the water and then dissolving the ethylene glycol monobutyl ether in such solution, followed by admixing in the perfume to form a stable clear homogeneous o/w microemulsion. As a measure of "dissolving power" of this composition for water-insoluble liquids, 100 grams of the liquid are placed in a beaker and liquid pentane is added dropwise to the liquid, with gentle agitation, until the composition turns from clear to cloudy. 18 Grams of pentane are solubilized and the liquid remains clear and homogeneous. Similarly, when petroleum ether (b.p.=60.degree.-80.degree. C.) is used as the water-insoluble liquid, 15 grams can be "dissolved" in the liquid o/w microemulsion without resulting in phase separation and without the liquid becoming cloudy.

Detailed Description Text (5):

The "dissolving power" of the o/w microemulsion of this example is compared to the "dissolving power" of an composition which is identical except that an equal proportion (5%) of sodium cumene sulfonate hydrotrope is used in place of the ethylene glycol monobutyl ether co-surfactant in a test wherein heptane is added to both compositions. The o/w microemulsion of this invention solubilizes 12.6 grams of the heptane, compared to 1.4 grams that are solubilized by the hydrotrope-containing composition.

Detailed Description Text (13):
When the percentage of water in the formula is very much decreased the emulsion or microemulsion made is of the w/o type, but it can form an o/w microemulsion upon dilution with water, in the manner previously described.

Detailed Description Text (21):
The foregoing composition is prepared by dispersing the magnesium oxide in water followed by the addition of the dodecylbenzene sulfonic acid, with agitation, to form the neutralized sulfonate. Thereafter, the nonionic detergent, the co-surfactant and the perfume are added in sequence to form an o/w microemulsion composition having a pH of 7.0.+-.0.2. The composition is useful to remove greasy soil, such as lard, from test plates, tiles and even from fabrics, without rinsing being needed to clean the hard surfaced items. Similar good results are obtainable by substituting the others of the disclosed co-surfactants for the diethylene glycol monobutyl ether (DEGMBE), alone or in various mixtures thereof.

Detailed Description Text (38):
This example is presented to show that in the formulation of this invention the co-surfactant does not in itself contribute to grease removal performance. The cleaning performance test described in Example 8 is repeated, using the o/w microemulsion of Example 7-A and an identically prepared composition with the exception that the diethylene glycol monobutyl ether is replaced by an equal weight of water. The results obtained are set forth in Table B.

Detailed Description Text (40):
When an additional comparison is made between the composition of Example 7-A and an identical composition except that the diethylene glycol monobutyl ether (DEGMBE) co-surfactant is replaced by an equivalent weight of 1:1:1 mixture of succinic acid:glutaric acid:adipic acid, the following results are obtained.

Detailed Description Text (45):
In the foregoing comparisons, the dilute o/w microemulsion compositions, containing different proportions of perfume, solubilize five times more oleic acid than do "comparable" emulsion compositions containing cumene sulfonate hydrotrope in place of the DEGMBE co-surfactant.

Detailed Description Paragraph Table (1):
Percent
Sodium C.sub.13-17 paraffin sulfonate 4.0 C.sub.9-11 Alcohol EO5:1 (Dobanol 91-5) 3.0 Ethylene glycol monobutyl ether 5.0 *Perfume (mix of essential oils, esters, 1.0 ethers and aldehydes) MgSO.sub.4.7 H.sub.2 O 1.5 Water 85.5 pH of product: 7.0 .+-. 0.2 100.00
*contains about 2% by weight of

terpenes

Detailed Description Paragraph Table (2):

Percent

Sodium C.sub.13-17 paraffin sulfonate 20 C.sub.9-11 Alcohol EO5:1 15 Ethylene glycol monobutyl ether 20 *Perfume 15 Water 30 pH of microemulsion: 7.0 .+-. 0.2 100

Detailed Description Paragraph Table (4):

Percent

Magnesium oxide 0.33 Linear dodecylbenzene sulfonic acid 5.25 C.sub.9-11 alcohol EO 7.5-8:1 1.75 Diethylene glycol monobutyl ether 4.00 Perfume (2% terpenes) 1.00 Water 87.67 100.00

Detailed Description Paragraph Table (5):

Percent A B

Sodium C.sub.13-17 paraffin sulfonate 4.0 4.0 C.sub.9-11 alcohol EO 5:1 3.0 3.0 Magnesium oxide 0.25 0.25 Distilled coconut oil fatty acids (C.sub.8-18) 0.5 0.5 Diethylene glycol monobutyl ether 5.0 Ethylene glycol monobutylether 5.0 Perfume *1.0 ***1.0 Dye 0.0015 0.0015 H.sub.2 SO.sub.4 or NaOH (for pH adjustment) to pH 6.8 .+-.0.2 Formalin 0.2 0.2 Antioxidant 0.1 0.1 H.sub.2 O 85.9485 85.9485 100.00 100.00

*contains 2% of terpenes, approximately ***contains 70% of terpenes, approximately

Detailed Description Paragraph Table (6):

Percent A B

Sodium C.sub.13-17 paraffin sulfonate 4.0 4.0 C.sub.9-11 alcohol EO 5:1 3.0 4.0 MgO 0.25 0.25 Diethylene glycol monobutyl ether 3.75 -- Ethylene glycol monobutyl ether -- 3.75 ****Perfume 1.0 1.0 H.sub.2 SO.sub.4 or NaOH to pH 6.8 to pH 6.5 Formalin 0-0.2 0-0.2 Antioxidant 0-0.1 0-0.1 Water 87.7-88.0 86.7-87.0 100.0 100.0

****Contains about 43% dlimonene, 10% grapefruit oil, 6% of other terpenes, and balance of esters, aldehydes and ethers

Detailed Description Paragraph Table (10):

% by weight Component 10A 10B 10C 10D

Sodium C.sub.13-17 paraffin 4.0 4.0 4.0 4.0 sulfonate C.sub.9-11 alcohol EO 5:1 3.0 3.0 3.0 3.0 Diethylene glycol monobutyl 4.0 4.0 -- -- ether Magnesium oxide 0.25 0.25 0.25 0.25 Sodium cumene sulfonate -- -- 4.0 4.0 Perfume (2% terpenes) 1.0 0.4 1.0 0.4 Water 87.75 88.35 87.75 88.35 100.00 100.00 100.00 100.00

CLAIMS:

2. A stable microemulsion cleaning composition according to claim 1, wherein the synthetic organic detergent component is a mixture of anionic and nonionic synthetic organic detergents and the co-surfactant is a water soluble lower alkanol of 2 to 4 carbon atoms, a polypropylene glycol of 2 to 18 propoxy units, a monoalkyl ether of a lower glycol of the formula RO

(X).sub.n H wherein R is a C.sub.1-4 alkyl and X is CH.sub.2 CH.sub.2 O, CH (CH.sub.3)CH.sub.2 O or CH.sub.2 CH.sub.2 CH.sub.2 O, and n is from 1 to 4, a monoalkyl ester of the formula R.sup.1 O(X).sub.n H wherein R.sup.1 is a C.sub.2-4 acyl and X and n are as immediately previously described, an aryl substituted lower alkanol of 1 to 6 carbon atoms, propylene carbonate, an aliphatic mono-, d i-, or tri-carboxylic acid of 3 to 6 carbon atoms, a mono-, di- or tri-hydroxy substituted aliphatic mono-, di-, or tri-carboxylic acid of 3 to 6 carbon atoms, a higher alkyl ether poly-lower alkoxy carboxylic acid of the formula R.sup.2 O(X).sub.n YCOOH, wherein R.sup.2 is a C.sub.9-15 alkyl, n is from 4 to 12, and Y is CH.sub.2, C(O)R.sup.3 or ##STR2## wherein R.sup.3 is a C.sub.1-3 alkylene, or a lower alkyl mono-, di-, or tri-ester of phosphoric acid, wherein the lower alkyl is of 1 to 4 carbon atoms, or any mixture thereof.

5. A composition according to claim 4 wherein the perfume includes 1 to 35% of terpenes, on a product basis, and the co-surfactant is ethylene glycol monobutyl ether, diethylene glycol monobutyl ether, dipropylene glycol monobutyl ether, dipropylene glycol isobutyl ether, glutaric acid or a mixture of glutaric, adipic and succinic acids, or any mixture thereof, and in which the microemulsion is of dispersed phase particle sizes in the range of 50 to 1500 .ANG. in diameter.

10. A composition according to claim 1 wherein the co-surfactant is dipropylene glycol monobutyl ether or dipropylene glycol isobutyl ether or a mixture thereof.

16. A process for manufacturing a stable clear aqueous microemulsion cleaning composition which is in accordance with the description thereof in claim 1, which comprises dissolving the synthetic organic detergent in the water, admixing the co-surfactant with the aqueous detergent solution and subsequently admixing the perfume with the aqueous solution or emulsion of detergent, water and co-surfactant, at a temperature in the range of 5.degree. to 50.degree. C., which results in a clear and stable microemulsion cleaning composition which is of a pH in the range of 1 to 11 and in which the microemulsion is of dispersed phase particle sizes in the range of 50 to 1,500 .ANG. in diameter.

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L10: Entry 2 of 15 File: USPT Oct 27, 1992

DOCUMENT-IDENTIFIER: US 5158710 A
TITLE: Aqueous cleaner/degreaser microemulsion compositions

Brief Summary Text (3):
Heretofore, all of the conventional and available ready to use and concentrated water soluble, dilutable cleaner/degreaser compositions have expediently contained infinitely or highly water soluble organic solvents such as butyl cellosolve (ethylene glycol monobutyl ether), butyl carbitol (diethylene glycol monobutyl ether), ethyl carbitol, propylene glycol monomethyl ether, dipropylene glycol monomethyl ether or isopropanol together with anionic or nonionic surfactants and conventional adjuvants such chelants, builders, perfumes, dyes, pH adjustors, etc., these components falling generally within the following compositional wt. % ranges:

Detailed Description Text (10):
The principal classes of organic solvents from which useful organic solvents may be selected include esters, alcohols, ketones, aldehydes, ethers and nitriles. These will generally contain one or more of the desired similar or dissimilar functional groups listed above. Examples of organic solvents containing similar functional groups from among those listed above include diethyl gluterate (2 ester groups), phenacyl acetone (2 keto groups), diethylethyl phosphonate (2 phosphonate ester groups), ethylenedipropionate (2 ester groups), decylene glycol (2 hydroxyl groups), m-dimethoxybenzene (2 ether groups), adiponitrile (2 nitrile groups), ethylene glycol dibutyl ether (2 ether groups), and diethyl-o-phthalate (2 ester groups). Among organic solvents containing dissimilar functional groups from among those listed above may be mentioned 2-phenoxyethanol (hydroxy, ether groups), 1-phenoxy-2-propanol (hydroxy, ether groups), N-phenylmorpholine (amino, ether groups), isopropylacetoacetate (keto, ester groups), o-methoxybenzyl alcohol (ether, hydroxy groups), 4'-methoxyacetophenone (ether, ketone groups), o-nitrophenetole (nitro, ether groups), 2-hexoxyethanol (hydroxy, ether groups), ethylcyanoacetoacetate (cyano, keto, ester groups), p-anisaldehyde (ether, aldehyde groups), polypropylene glycol 1200 (ether, hydroxyl groups), n-butoxy acetate (ether, ester groups), and 2-phenylthioethanol (thioether, hydroxyl groups).

Detailed Description Text (13):
As indicated, a number of otherwise potent organic solvents having an aqueous solubility of less than approximately 0.2 weight percent such as 2-(2-ethylhexoxy)ethanol (2-ethylhexyl cellosolve) having an aqueous solubility of only 0.095 wt. %, and 2,6-dimethyl -4-heptanone (diisobutyl ketone) (aq. sol. 0.05 wt. %), and organic solvents having an aqueous solubility in excess of approximately 6 weight percent such as propylene glycol monomethyl ether

acetate (aq. sol. 16.5 wt. %), ethylene glycol diacetate (aq. sol. 14.3 wt. %), propylene carbonate (aq. sol. 19.6 wt. %) and N-methyl pyrrolidone (infinite aq. sol.) are not useful in the practice of the invention.

Detailed Description Text (17):
Among the useful nonionic surfactants which may be employed may be mentioned octylphenoxypoly(ethyleneoxy)(11)ethanol, nonylphenoxypoly(ethyleneoxy)(13) ethanol, dodecylphenoxypoly(ethyleneoxy)(10)ethanol, polyoxyethylene (12) lauryl alcohol, polyoxyethylene (14) tridecyl alcohol, lauryloxypoly (ethyleneoxy)(10)ethyl methyl ether, undecylthiopoly(ethyleneoxy)(12)ethanol, methoxypoly(oxyethylene(10)/(oxypropylene(20))-2-propanol block copolymer, nonyloxypoly(propyleneoxy)(4)/(ethyleneoxy)(16)ethanol, dodecyl polyglycoside, polyoxyethylene (9) monolaurate, polyoxyethylene (8) monoundecanoate, polyoxyethylene (20) sorbitan monostearate, polyoxyethylene (18) sorbitol monotallate, sucrose monolaurate, lauryldimethylamine oxide, myristyldimethylamine oxide, lauramidopropyl-N,N-dimethylamine oxide, 1:1 lauric diethanolamide, 1:1 coconut diethanolamide, 1:1 mixed fatty acid diethanolamide, polyoxyethylene(6)lauramide, 1:1 soya diethanolamidopoly (ethyleneoxy)(8) ethanol, coconut diethanolamide, "modified", and coconut diethanolamide, "long chain modified". Other known nonionic surfactants may likewise be used.

Detailed Description Text (20):
The couplers which may be utilized in the practice of the invention include sodium benzene sulfonate, sodium toluene sulfonate, sodium xylene sulfonate, potassium ethylbenzene sulfonate, sodium cumene sulfonate, sodium octane-1-sulfonate, potassium dimethylnaphthalene sulfonate, ammonium xylene sulfonate, sodium n-hexyl diphenyoxide disulfonate, sodium 2-ethylhexyl sulfate, ammonium n-butoxyethyl sulfate, sodium 2-ethylhexanoate, sodium pelargonate, sodium n-butoxymethyl carboxylate, potassium mono/di phenoxyethyl phosphate, sodium mono/di n-butoxyethyl phosphate, triethanolamine trimethylolpropane phosphate, sodium capryloamphopropionate, disodium caprylo iminodipropionate, and sodium capro imidazoline amphoylycinate. Certain water-soluble solvents known to the art as couplers such as propylene glycol ethers (e.g. tripropyleneglycol monomethyl ether) can be used in the practice of the invention, but cannot be substituted for the sparingly water soluble organic solvent component. Additional couplers or hydrotropes known to the art may also be utilized.

Detailed Description Text (24):
In formulating the compositions of the invention, the various components as brought together may first form an oily suspension which becomes an emulsion upon the addition of a surfactant/coupler, and is then finally transformed into a microemulsion through the addition of the final portion of the solubilizing coupler. For example, 2.0 wt. % sodium metasilicate, 7.5 wt. % 1-phenoxy-2-Propanol, 2.5 wt. % tripropyleneglycol monomethyl ether and 76.4 wt. % soft water are stirred to form an oily suspension having a pH of 13.3. 2.4 wt. % dodecylbenzenesulfonic acid is added with stirring to form a creamy white emulsion having a pH of 13.1. 7.2 wt. % sodium xylene sulfonate (40%) is then added with stirring whereupon some slight lightening of the emulsion occurs. The addition of 1.8 wt. % sodium xylene sulfonate (40%) causes the emulsion to become still lighter but it remains opaque. Upon the final addition of 0.2 wt. % sodium xylene sulfonate (40%) with stirring, the white emulsion is transformed into a bluish microcolloidal microemulsion having a

pH of 13.05. The microemulsions of the invention can also be formulated by combining the various components together in different sequence to transform any emulsion formed into a microemulsion. The addition of an excess of the solubilizing additive to the formulation will cause the microemulsion to be converted into a solution and is to be avoided if optimum cleaning/degreasing efficacy of the builder-containing formulations is to be achieved.

Detailed Description Text (37):
The sodium metasilicate was dissolved in water with stirring. The monoethanolamine, 1-phenoxy-2-propanol and dodecylbenzenesulfonic acid were added and stirring of the resultant emulsion/suspension was continued until the emulsion gradually cleared to produce an irridescent (blue) microemulsion. The microemulsion had a pH of 12.65, a total solids content of 2.5% and a total actives content of 7.3%. Upon heating, the microemulsion remained irridescent to 50.degree. C., then developed more turbidity up to 75.degree. C. and became a clear, colorless aqueous solution above about 75.degree. C. It exhibited no cloud point to 100.degree. C.

Detailed Description Text (46):
The composition was a bluish, irridescent microemulsion having a pH of 12.5, a total solids content of 4.4% and a total actives content of 8.4%. Upon heating, the composition remained an irridescent microemulsion to 48.degree. C., became a turbid emulsion between 48.degree.-59.degree. C. and a clear, colorless solution above about 60.degree. C.

Detailed Description Text (200):
The organic solvent component, Propylene glycol mono-t-butyl ether, has an aqueous solubility of 13.9 wt. % at 21.degree. C. The composition was a very faint bluish, colloidal microemulsion having a pH of 13.73, a total solids content of 7.2% and a total actives content of 16.7%. It had a cloud point of 28.degree. C.

Detailed Description Text (338):
The sodium metasilicate was dissolved in water with stirring. The monoethanolamine was added followed by the addition of the 1-phenoxy-2-propanol, tripropyleneglycol monomethyl ether and dodecylbenzenesulfonic acid with stirring. Stirring was continued until a homogeneous emulsion formed. The Alkali Surfactant was then added and the emulsion was transformed into a microemulsion after which the defoaming agent was added. The resulting microemulsion had a slightly bluish, irridescent appearance, a pH of 12.42, a total solids content of 5.7% and a total actives content of 16.2%. It exhibited a cloud point in excess of 100.degree. C.

Detailed Description Paragraph Table (15):
Component Wt. %
Anhydrous sodium 3.6 metasilicate
Dodecylbenzenesulfonic 2.80 acid Chelating Agent 2.00 (Hampene 100) Propyleneglycol 2.00 monomethyl ether Dipropyleneglycol 0.95 monomethyl ether Tripropyleneglycol 0.70 monomethyl ether 1-Phenoxy-2-propanol 6.35 (Dowanol PPh) Sodium xylene sulfonate 8.50 Soft H.sub.2 O 73.10 100.0

Detailed Description Paragraph Table (16):
Component Wt. %

Anhydrous sodium 5.50 metasilicate
Dodecylbenzenesulfonic acid 5.00 Chelating Agent 2.00 (Hampene 100) Propyleneglycol 2.00 monomethyl ether Dipropyleneglycol 0.95 monomethyl ether Tripropyleneglycol 0.70 monomethyl ether 1-Phenoxy-2-propanol 6.35 (Dowanol PPh) Sodium xylene sulfonate (40%) 8.5 Soft H.sub.2 O 69.0 100.0

Detailed Description Paragraph Table (17):

Component Wt. %
Anhydrous sodium 4.0 metasilicate
Dodecylbenzenesulfonic acid 2.0 Propylene glycol mono-t-butyl 9.5 ether (Arcosolve PTB) Chelating agent (Hampene 100) 3.0 Soft H.sub.2 O 81.5 100.0

Detailed Description Paragraph Table (18):

Component Wt. %
Anhydrous sodium 2.0 metasilicate
Nonylphenol ethoxylate 3.5 (T-Det N-14) Chelating agent 2.0 (Hampene 100, 40%) Dipropylenegycol 3.5 monomethyl ether 1-Phenoxy-2-propanol 6.5 (Dowanol PPh) Sodium xylene sulfonate (40%) 11.0 Soft H.sub.2 O 71.5 100.0

Detailed Description Paragraph Table (19):

Component Wt. %
Anhydrous sodium 2.0 metasilicate
Dodecylbenzenesulfonic acid 1.5 Chelating agent 5.0 (Hampene 100, 40%) Benzyl acohol 9.0 Tripropyleneglycol 1.0 monomethyl ether Sodium xylene sulfonate (40%) 9.5 Soft H.sub.2 O 7.2 100.0

Detailed Description Paragraph Table (20):

Component Wt. %
Anhydrous sodium 2.0 metasilicate
Dodecylbenzenesulfonic acid 2.5 Chelating agent 1.5 (Hampene 100, 40%) Tripropyleneglycol 2.5 monomethyl ether 1-Phenoxy-2-propanol 7.0 (Dowanol PPh) Sodium xylene sulfonate (40%) 9.0 Soft H.sub.2 O 75.5 100.0

Detailed Description Paragraph Table (21):

Component Wt. %
Dodecylbenzenesulfonic acid 2.5 Sodium hydroxide (50%) 0.4 Chelating agent 1.5 (Hampene 100, 40%) Tripropyleneglycol 2.5 monomethyl ether 1-Phenoxy-2-propanol 7.0 (Dowanol PPh) Sodium xylene sulfonate (40%) 6.5 Soft H.sub.2 O 7.96 100.0

Detailed Description Paragraph Table (22):

Component Wt. %
Sodium tripolyphosphate 2.0
Dodecylbenzenesulfonic acid 2.5 Chelating agent 1.5 (Hampene 100, 40%) Tripropyleneglycol 2.5 monomethyl ether 1-Phenoxy-2-propanol 7.0 (Dowanol PPh) Sodium xylene sulfonate (40%) 7.5 Soft H.sub.2 O 76.4 100.0

Detailed Description Paragraph Table (24):

Component Wt. %
Anhydrous sodium metasilicate 2.0
Dodecylbenzenesulfonic acid 2.4 Ethylene glycol monobutyl 10.0 ether (Butyl Cellosolve) Soft H.sub.2 O 85.6 100.0

Detailed Description Paragraph Table (25):
Component Wt. %
Anhydrous sodium metasilicate 2.3
Dodecylbenzenesulfonic acid 2.8 Tripropyleneglycol monomethyl 5.0 ether Acetophenone 5.0 Soft H.sub.2 O 84.9 100.0

Detailed Description Paragraph Table (26):
Component Wt. %
Anhydrous sodium metasilicate 2.0
Dodecylbenzenesulfonic acid 2.5 Cyclohexanol 8.5 Tripropyleneglycol 1.5 monomethyl ether Sodium xylene sulfonate (40%) 5.4 Soft H.sub.2 O 80.1 100.0

Detailed Description Paragraph Table (28):
Component Wt. %
Monoethanolamine 0.5 Sodium Metasilicate 2.0 1-Phenoxy-2-propanol 7.0 (Dowanol PPh) Tripropyleneglycol monomethyl 3.0 ether Dodecylbenzenesulfonic acid 3.0 Soft H.sub.2 O 82.4 Isodecyloxypropylimino- 2.0 dipropionic acid ("Alkali Surfactant", Tomah Products, 35%) Defoaming agent 0.1 (Atsurf F-12) 100.0

CLAIMS:

3. A stable, aqueous cleaner/degreaser composition as set forth in claim 1 wherein said organic solvent is selected from the group consisting of esters, alcohols, ketones, aldehydes, ethers and nitriles.

15. A stable, aqueous cleaner/degreaser composition as set forth in claim 1 wherein said surfactant is a nonionic surfactant selected from the group consisting of octylphenoxypoly(ethyleneoxy)(11)ethanol, nonylphenoxypoly (ethyleneoxy)(13)ethanol, dodecylphenoxypoly(ethyleneoxy)(10)ethanol, polyoxyethylene (12) lauryl alcohol, polyoxyethylene (14) tridecyl alcohol, lauryloxypoly(ethyleneoxy)(10)ethyl methyl ether, undecylthiopoly (ethyleneoxy) (12)ethanol, methoxypoly(oxyethylene(10)/(oxypropylene (20))-2-propanol block copolymer, nonyloxypoly(propyleneoxy) (4)/(ethyleneoxy)(16) ethanol, dodecyl polyglycoside, polyoxyethylene(9)-monolaurate, polyoxyethylene(8)monoundecanoate, polyoxyethylene(20)sorbitan monostearate, polyoxyethylene(18)sorbitol monotallate, sucrose monolaurate, lauramidopropyl-N,N-dimethylamine oxide, 1:1 lauric diethanolamide, 1:1 coconut diethanolamide, 1:1 mixed fatty acid diethanolamide, polyoxyethylene (6) lauramide, 1:1 soya diethanolamidopoly(ethyleneoxy)(8) ethanol, and coconut diethanolamide.